CLAIMS

1. A method of determining a gain control signal for a multilevel read signal comprising:

detecting a maximum signal in an interior portion of a maximum automatic gain control mark wherein the automatic gain control mark includes a series of high level marks such that the maximum signal detected in the interior portion of the maximum automatic gain control mark is not reduced by intersymbol interference;

detecting a minimum signal in an interior portion of a minimum automatic gain control mark wherein the automatic gain control mark includes a series of low level marks such that the minimum signal detected in the interior portion of the minimum automatic gain control mark is not reduced by intersymbol interference;

determining the envelope of the signal from the maximum signal and the minimum signal; and

computing a gain control signal such that variance in the envelope of the signal over time is reduced.

2. A method of determining a gain control signal for a multilevel read signal as recited in claim 1 wherein the gain control signal controls a digital gain amplifier.

3. A method of determining a gain control signal for a multilevel read signal as recited in claim 1 wherein the gain control signal controls an analog variable gain amplifier.

4. A method of determining a gain control signal for a multilevel read signal as recited in claim 1 wherein the maximum automatic gain control mark and the minimum automatic gain control mark are combined so that the DC value of the combined mark is zero.

5. A method of determining a gain control signal for a multilevel read signal as recited in claim 1 wherein an average maximum is determined over a plurality of maximum signals and an average minimum is determined over a plurality of minimum signals and wherein the envelope of the signal is determined using the average maximum and the average minimum.

6. A method of determining a gain control signal for a multilevel read signal as recited in claim 5 wherein the average maximum is determined using a sliding window.

7. A method of determining a gain control signal for a multilevel read signal as recited in claim 5 wherein the average minimum is determined using a sliding window.

8. A method of determining a gain control signal for a multilevel read signal as recited in claim 1 wherein the multilevel read signal is read from an optical disc.

9. A method of encoding a multilevel signal comprising:

periodically inserting a maximum automatic gain control mark amongst a series of data fields wherein the automatic gain control mark includes a series of high level marks such that the maximum signal detected in the interior portion of the maximum automatic gain control mark is not reduced by intersymbol interference; and

periodically inserting a minimum automatic gain control mark amongst a series of data fields wherein the automatic gain control mark includes a series of high level marks such that the maximum signal detected in the interior portion of the minimum automatic gain control mark is not reduced by intersymbol interference.

10. An automatic gain control circuit comprising:

an envelope detector configured to compute a gain control signal by:

detecting a maximum signal in an interior portion of a maximum automatic gain control mark wherein the automatic gain control mark includes a series of high level marks such that the maximum signal detected in the interior portion of the maximum automatic gain control mark is not reduced by intersymbol interference;

detecting a minimum signal in an interior portion of a minimum automatic gain control mark wherein the automatic gain control mark includes a series of low level marks such that the minimum signal detected in the interior portion of the minimum automatic gain control mark is not reduced by intersymbol interference; and

determining the envelope of a read signal from the maximum signal and the minimum signal; and

a variable gain amplifier controlled by the gain control signal such that the variance of the envelope of the read signal over time is reduced.

11. A multilevel write channel comprising:

a data source; and

a symbol merger configured to insert a maximum automatic gain control mark wherein the automatic gain control mark includes a series of high level marks such that the maximum signal detected in the interior portion of the maximum automatic gain control mark is not reduced by intersymbol interference and to insert a minimum automatic gain control mark wherein the automatic gain control mark includes a series of low level marks such that the minimum signal detected in the interior portion of the minimum automatic gain control mark is not reduced by intersymbol interference.

12. A multilevel medium comprising:

data fields containing data;

maximum automatic gain control marks wherein the automatic gain control mark includes a series of high level marks such that the maximum signal detected in the interior portion of the maximum automatic gain control mark is not reduced by intersymbol interference; and

minimum automatic gain control marks wherein the automatic gain control mark includes a series of low level marks such that the minimum signal detected in the interior portion of the minimum automatic gain control mark is not reduced by intersymbol interference;

wherein the minimum automatic gain control marks and the maximum automatic gain control marks are periodically inserted between the data fields.

13. A method of encoding a multilevel signal to facilitate automatic gain control comprising:

determining the effect of a plurality of candidate merge symbols on the residual running total power associated with a current data block;

selecting a preferred merge symbol based on a residual running total power minimization criteria; and

adding the preferred merge symbol to the current data block.

14. A method of encoding a multilevel signal to facilitate automatic gain control as recited in claim 13 wherein the merge symbol does not encode data.

15. A method of encoding a multilevel signal to facilitate automatic gain control as recited in claim 13 wherein the merge symbol is inserted before the current data block.

16. A method of encoding a multilevel signal to facilitate automatic gain control as recited in claim 13 wherein the residual running total power minimization criteria is the absolute value of the residual running total power at the end of the block.

17. A method of encoding a multilevel signal to facilitate automatic gain control as recited in claim 13 wherein the residual running total power minimization criteria is the maximum absolute value of the residual running total power occurring in the block.

18. A method of encoding a multilevel signal to facilitate automatic gain control as recited in claim 13 wherein the residual running total power minimization criteria is a combination of the absolute value of the residual running total power at the end of the block and the maximum absolute value of the residual running total power occurring in the block.

19. A method of encoding a multilevel signal to facilitate automatic gain control as recited in claim 13 wherein the preferred merge symbol is also selected based on a running digital sum minimization criteria.

20. A method of encoding a multilevel signal to facilitate automatic gain control as recited in claim 19 wherein the preferred merge symbol is selected based on a linear weighted sum of the absolute values of the running digital sum minimization criteria and the residual running total power minimization criteria.

21. A method of encoding a multilevel signal to facilitate automatic gain control as recited in claim 13 further including adding a sector clean up field to a sector to zero out the residual running total power in the sector.

22. A method of encoding a multilevel signal to facilitate automatic gain control as recited in claim 13 wherein the multilevel signal is written to an optical disc.

23. A multilevel write channel comprising:

a data source providing a series of data blocks; and

a symbol merger configured to insert a merge symbol into each data block wherein the merge symbol is selected by determining the effect of a plurality of candidate merge symbols on the residual running total power associated with the data block and applying a residual running total power minimization criteria.

24. A multilevel medium comprising:

a plurality of data blocks that include a merge symbol wherein the merge symbol is selected by determining the effect of a plurality of candidate merge symbols on the residual running total power associated with each data block and applying a residual running total power minimization criteria.

10092317.040501